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BUCHANAN, INGERSOLL & ROONEY PC
POST OFFICE BOX 1404
ALEXANDRIA, VA 22313-1404

EXAMINER	
PRENDERGAST, ROBERTA D	

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2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 10/727,629	Applicant(s) PARK ET AL.	
	Examiner Roberta Prendergast	Art Unit 2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 July 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,5-8,16-18,21-25,28 and 30-33* is/are rejected.

7)☒ Claim(s) *4,9-15,19,20,26,27 and 29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 7-28-06
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Art Unit Designation has changed from 2671 to 2628

Drawings

Examiner acknowledges the amendment to the specification filed on 6/22/2006 correcting the errors that resulted in the objection to the drawings and therefore the objection to the drawings is hereby withdrawn.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 7, 16 and 17 are rejected under 35 U.S.C. 102(a) as being anticipated by Samet et al., "Octree Approximation and Compression Methods", Proceedings of First International Symposium on 3D Data Processing Visualization and Transmission, June 2002, IEEE Computer Society, pgs.1-10, hereinafter Samet et al.

Referring to claim 7, Samet et al. teaches a method of encoding three-dimensional object data, which is comprised of point texture data, voxel data, or octree structure data, the method comprising:

(a) generating three-dimensional object data having a tree structure of a predetermined depth in which nodes include attached labels indicating their respective

types, the types comprising nodes having sub-nodes, nodes having all voxels located in a background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background (page 2, section 2 Octree representation, 1st and 2nd paragraphs, i.e. internal/non-leaf nodes are labeled GRAY indicating nodes having sub-nodes and nodes at the predetermined depth having voxels where objects exist and in the background, occupied nodes are labeled BLACK indicating nodes having all voxels located where objects exist, and unoccupied nodes are labeled WHITE indicating nodes having all voxels located in a background);

(b) merging the nodes of the three-dimensional object data by referring to their labels (Abstract; page 2, section 2 Octree representation, 2nd paragraph, i.e. each non-leaf/GRAY node is labeled BLACK/GB if at least 4 of its children are black and WHITE/GW if 4 or more of its children are labeled as WHITE or GW thereby merging the children with the parent);

(c) encoding merged nodes (page 5, section 3 Compression, 1st paragraph, i.e. merged nodes are encoded using approximation method);

(d) generating the three-dimensional object data whose merged nodes are encoded into a bitstream (page 1, Abstract; page 1, section 1 Introduction, 1st paragraph; page 2, section 2 Octree representation, 1st paragraph and final paragraph; page 7-8, section 4 Empirical results, 1st and 2nd paragraphs, i.e. 3d binary objects are represented by an octree, and an octree with a maximum depth of 7 is comprised of 128X128X128 voxels/nodes, which are binary encoded as black or white and added to

a compressed bitstream thereby generating and transmitting the compressed bitstream data for the 3d object); and

(e) repeatedly carrying out steps (a) through (d) until an uppermost node of the tree structure representing the three-dimensional object data is encoded.

Referring to claim 16, the rationale for claim 7 is incorporated herein, Samet et al. teaches wherein in encoding the nodes of the three-dimensional object data, only some of the nodes of the three-dimensional object data, ranging from a root node to a predetermined lower node, are encoded (pages 2-3, section 2 Octree representation, 3rd and 4th paragraphs; page 5, section 3 Compression, 1st paragraph, i.e. a two-color/binary region octree is defined by enumerating the location codes of either the black or white nodes, the color with the smaller cardinality).

Referring to claim 17, the rationale for claim 7 is incorporated herein, Samet et al. teaches wherein in step (c), all the merged nodes are encoded (page 2, section 2 Octree representation, 2nd paragraph; page 3, section 2.2 Forest-based approximation techniques, 1st, 2nd, and final paragraphs, i.e. each non-leaf node is merged and encoded as GB if at least four of its children are BLACK or GB and encoded as GW otherwise and then the region octree is compressed using FBW to alternate between the FBB and FWW approximation methods).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 6, 24, 28, 30 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prevost et al. U.S. Patent No. 5123084 in view of Rambally et al., "Octrees and their applications in image processing", Proceedings of IEEE Southeastcon '90, April 1990, pages 1116-1120, Vol.3.

Referring to claim 1, Prevost et al. teaches a method of encoding three-dimensional object data, which is comprised of point texture data, voxel data, or octree structure data, the method comprising generating three-dimensional object data using a three-dimensional bounding volume to convert the three-dimensional object data into voxel data (Figs. 1 and 2(A-D); column 5, lines 41-67, i.e. each 3d object is surrounded by a bounding box comprising the initial object universe and is split into cubes/nodes/voxels such that level 0 of the octree is the root which contains the whole object), wherein the voxels are differentiated based on whether they are located where objects exist or in a background (column 3, lines 51-67, i.e. each node/cube is labeled E, empty/unoccupied, F, full, and P, partially occupied); representing the voxel data by a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types (Figs. 1-2(A-D); column 1, lines 35-40; columns 3-4, lines 51-3, i.e. nodes are labeled E, to indicate if they are empty/unoccupied, F, to

indicate full, and P to indicate partially occupied); encoding nodes of the three-dimensional object data (column 3, lines 39-44; column 4, lines 41-65; column 5, lines 11-40, i.e. each block of node packets is encoded and stored in memory as 32-bit words); and generating the three-dimensional object data whose nodes are encoded into a bitstream (Abstract; column 1, lines 35-50; column 9, lines 57-65; columns 10, lines 57-65; column 11, lines 14-28; columns 14-15, lines 43-4, i.e. the 3d object data is generated from the fetched nodes of the octree) but does not specifically teach wherein the voxels are differentiated based on whether they are located where objects exist or in a background; and wherein the node types comprise nodes having subnodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background.

Rambally et al. teaches these limitations (page 1116, Introduction; pages 1116-1117, Object Representation, i.e. at each level of the octree the nodes/voxels are identified/differentiated based on whether they are located where objects exist, as leaf nodes that are BLACK, or in a background, as leaf nodes that are WHITE, and wherein the node types comprise nodes having subnodes/GRAY nodes, nodes having all voxels located where objects exist/BLACK, nodes having all voxels located in the background/WHITE, and nodes at the predetermined depth having voxels located where objects exist and in the background/GRAY nodes).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Prevost et al. with the

teachings of Rambally et al. thereby providing an effective data structure for computer graphics and image processing that can be used as the primary data structure in a number of 3D applications in image processing (Rambally et al.: page 1116, Abstract; page 1120, Conclusion).

Referring to claim 6, the rationale for claim 1 is incorporated herein, Prevost et al., as modified above, teaches the method of claim 1 wherein in encoding the nodes of the three-dimensional object data, all the nodes of the three-dimensional object data are encoded (Prevost et al.: Figs. 1 and 2(A-D); column 3, lines 51-67, i.e. all nodes are encoded with a label indicating the type, E, empty/unoccupied, F, full, and P, partially occupied).

Referring to claim 24, the rationale for claim 1 is incorporated herein, Prevost et al., as modified above, teaches a method of decoding three-dimensional object data, comprising decoding nodes of a bitstream of encoded three-dimensional object data; and restoring the three-dimensional object data whose nodes are encoded to a tree structure (Abstract; column 1, lines 35-50; column 9, lines 57-65; columns 10, lines 57-65; column 11, lines 14-28; columns 14-15, lines 43-4, i.e. the 3d object data is generated from the fetched nodes of the octree and displayed indicating that the 3d object data is being decoded from the octree into which it is has been previously encoded).

Referring to claim 28, claim 28 is similar in scope to claim 24 and therefore the rationale for the rejection of claim 24 is incorporated herein, Prevost et al., as modified above, teaches an apparatus comprising a bitstream reader (column 11, lines 29-33); a

node decoder (column 11, lines 33-41; column 12, lines 8-27 and 52-64; column 14, lines 3-31); and a tree structure restorer (Fig. 11; column 1, lines 57-62; column 9, lines 57-65; columns 10, lines 50-65; column 11, lines 14-28; columns 14-15, lines 43-4, i.e. an apparatus for performing the method of claim 24 wherein a bitstream of encoded 3d object data is being fetched from memory and decoded and a target tree structure is being determined from the fetched and decoded nodes is understood to be comprised of a bitstream reader; a node decoder; and a tree structure restorer).

Referring to claim 30, the rationale for claim 1 is incorporated herein, Prevost et al., as modified above, teaches a computer-readable recording medium on which a program enabling the method of claim 1 is recorded (column 10, lines 50-65; column 11, lines 19-26; columns 11-12, lines 65-1; column 15, lines 42-47; column 18, lines 27-30; column 19, lines 14-16; column 23, lines 12-20; column 26, lines 9-19 and 49-67, i.e. an apparatus, comprising a geometrical processor and circuitry for performing to functions as described above wherein the functions are programmable is understood to comprise a computer-readable recording medium on which a program is recorded).

Referring to claim 33, the rationale for claim 24 is incorporated herein, Prevost et al., as modified above, teaches a computer-readable recording medium on which a program enabling the method of claim 24 is recorded (column 10, lines 50-65; column 11, lines 19-26; columns 11-12, lines 65-1; column 15, lines 42-47; column 18, lines 27-30; column 19, lines 14-16; column 23, lines 12-20; column 26, lines 9-19 and 49-67, i.e. an apparatus, comprising a geometrical processor and circuitry for performing to

functions as described above wherein the functions are programmable is understood to comprise a computer-readable recording medium on which a program is recorded).

Claims 18, 21, 22 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Samet et al. as applied to claim 7 above.

Referring to claim 18, claim 18 is similar in scope to claim 7 and therefore the rationale for the rejection of claim 7 is incorporated herein, Samet et al. recites the elements of claim 7 but does not specifically teach an apparatus comprising a tree structure generator; a merging order selector; a node encoder; and a bitstream generator.

However, Samet et al. does disclose empirical results obtained from experimentation (page 8, section 4 Empirical results, 1st paragraph; page 8, table 2, i.e. results obtained by experiments indicate an apparatus upon which those experiments would have been performed) and therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Samet et al. to include an apparatus comprising a tree structure generator; a merging order selector; a node encoder; and a bitstream generator because a method for performing the transmission of graphical objects over the Internet with the minimum possible amount of data that is needed to rebuild the original object (page 1, section 1 Introduction, 1st paragraph) would necessarily require the hardware for performing the experiments required to obtain empirical results.

Referring to claim 21, the rationale for claim 18 is incorporated herein, Samet et al. teaches wherein in encoding the nodes of the three-dimensional object data, only some of the nodes of the three-dimensional object data, ranging from a root node to a predetermined lower node, are encoded (pages 2-3, section 2 Octree representation, 3rd and 4th paragraphs; page 5, section 3 Compression, 1st paragraph, i.e. a two-color/binary region octree is defined by enumerating the location codes of either the black or white nodes, the color with the smaller cardinality).

Referring to claim 22, the rationale for claim 18 is incorporated herein, Samet et al. teaches wherein in encoding the nodes of the three-dimensional object data, all of the merged nodes are encoded (Abstract; page 2, section 2 Octree representation, 2nd paragraph, i.e. each non-leaf/GRAY node is labeled BLACK/GB if at least 4 of its children are black and WHITE/GW if 4 or more of its children are labeled as WHITE or GW thereby merging the children with the parent).

Referring to claim 31, claim 31 is similar in scope to claims 7 and 18 and therefore the rationale for the rejection of claims 7 and 18 is incorporated herein, Samet et al. recites the elements of claims 7 and 18 but does not specifically teach a computer-readable recording medium on which a program enabling the method of claim 7 is recorded.

However, Samet et al. does disclose empirical results obtained from experimentation (page 8, section 4 Empirical results, 1st paragraph; page 8, table 2, i.e. results obtained by experiments indicate an apparatus upon which those experiments would have been performed) and therefore, it would have been obvious to one having

ordinary skill in the art at the time the invention was made that the method of Samet et al. must include an apparatus comprising a computer-readable recording medium on which a program enabling the method of claim 7 is recorded because a method for performing the transmission of graphical objects over the Internet with the minimum possible amount of data that is needed to rebuild the original object (page 1, section 1 Introduction, 1st paragraph) would necessarily require an apparatus and a computer-readable recording medium on which a program enabling the method of claim 7 is recorded in order to perform the experiments required to obtain empirical results.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Samet et al. as applied to claim 7 above, and further in view of Moffat, A., "Implementing the PPM data compression scheme", IEEE Transactions on Communications, Volume 38, Issue 11, Nov. 1990, pages 1917-1921, hereinafter Moffat.

Referring to claim 8, the rationale for claim 7 is incorporated herein, Samet et al. teaches the method of claim 7 wherein in step (a), a node having sub-nodes is labeled "GRAY", a node whose voxels are all located in the background is labeled "W" or "WHITE", a node whose voxels are all located where objects exist is labeled "B" or "BLACK", and a node at a predetermined depth whose voxels are located where objects exist and in the background is labeled "G" or "GRAY" wherein "G" or "GRAY" nodes are encoded (Abstract; page 2, section 2 Octree representation, 2nd paragraph, i.e. each internal/GRAY/non-leaf node is merged by counting the number of children/leaf nodes that are BLACK of GB and encoding each merged node as GB if at least 4 of its

children are black or GB and GW otherwise such that the number of children that are BLACK or GB are counted in a manner similar to the PPM algorithm) but does not specifically teach a node whose voxels are encoded using a prediction-by-partial-matching (PPM) algorithm wherein the node is labeled 'P'. Although Samet et al. does not disclose labeling the “G” or “GRAY” nodes found at a predetermined depth with a “P” to indicate the nodes to be encoded it would have been obvious to include the label ‘P’ for all nodes that have been encoded and “S” for all nodes that contain sub-nodes thereby differentiating internal nodes that are to be compressed/merged from internal nodes that are not to be encoded.

Moffat teaches a node whose voxels are encoded using a prediction-by-partial-matching (PPM) algorithm (page 1918, section III. Implementing PPM, 1st paragraph, i.e. a digital search tree containing nodes wherein each node has a counter that records the number of times a particular symbol, such as “B”, “W”, “GB” or “GW”, has been encountered).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Samet et al. with the teachings of Moffat thereby providing a method for performing the transmission of graphical objects over the Internet with the minimum possible amount of data that is needed to rebuild the original object while being able to present the data as soon as possible (Samet et al.: page 1, section 1 Introduction, 1st paragraph) by using the PPM data compression scheme because the adaptive nature of the scheme, and the flexibility afforded by the arithmetic coding, mean that an effective compression scheme will be

built for any input file that is reasonably homogenous (Moffat: page 1917, section I. Introduction, 1st paragraph).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Prevost et al. in view of Rambally et al. as applied to claim 1 above, and further in view of Samet et al.

Referring to claim 5, the rationale for claim 1 is incorporated herein, Prevost et al., as modified above, teaches the method of claim 1 but does not specifically teach wherein in encoding the nodes of the three-dimensional object data, only some of the nodes of the three-dimensional object data, ranging from a root node to a predetermined lower node, are encoded.

Samet et al. teaches this limitation (pages 2-3, section 2 Octree representation, 3rd and 4th paragraphs; page 5, section 3 Compression, 1st paragraph, i.e. a two-color/binary region octree is defined by enumerating the location codes of either the black or white nodes, the color with the smaller cardinality).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Prevost et al. with the teachings of Rambally et al. and Samet et al. thereby providing a method for performing the transmission of graphical objects over the Internet with the minimum possible amount of data that is needed to rebuild the original object while being able to present the data as soon as possible (Samet et al.: page 1, section 1 Introduction, 1st paragraph).

Claims 3, 23, 25 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prevost et al. in view of Rambally et al. as applied to claims 1 and 24 above, and further in view of Samet et al, and Moffat, A., “Implementing the PPM data compression scheme”, IEEE Transactions on Communications, Volume 38, Issue 11, Nov. 1990, pages 1917-1921, hereinafter Moffat.

Referring to claim 3, the rationale for claim 1 is incorporated herein, Prevost et al., as modified above, teaches the method of claim 1 wherein in the tree structure representing the three-dimensional object data, a node having sub-nodes is labeled 'P', a node whose voxels do not contain objects is labeled 'E', a node whose voxels all contain objects is labeled 'F', but does not specifically teach a node at a predetermined depth whose voxels are encoded using a prediction-by-partial-matching (PPM) algorithm is labeled 'P'.

Samet et al. teaches the method of claim 7 wherein in step (a), a node having sub-nodes is labeled “GRAY”, a node whose voxels are all located in the background is labeled “W” or “WHITE”, a node whose voxels are all located where objects exist is labeled “B” or “BLACK”, and a node at a predetermined depth whose voxels are located where objects exist and in the background is labeled “G” or “GRAY” wherein “G” or “GRAY” nodes are encoded (Abstract; page 2, section 2 Octree representation, 2nd paragraph, i.e. each internal/GRAY/non-leaf node is merged by counting the number of children/leaf nodes that are BLACK of GB and encoding each merged node as GB if at least 4 of its children are black or GB and GW otherwise such that the number of children that are BLACK or GB are counted in a manner similar to the PPM algorithm)

but does not specifically teach a node whose voxels are encoded using a prediction-by-partial-matching (PPM) algorithm wherein the node is labeled 'P'.

Moffat teaches a node whose voxels are encoded using a prediction-by-partial-matching (PPM) algorithm (page 1918, section III. Implementing PPM, 1st paragraph, i.e. each node has a counter that records the number of times a particular symbol, such as GB or GW, has been encountered).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Prevost et al. with the teachings of Samet et al. and Moffat thereby providing a method for performing the transmission of graphical objects over the Internet with the minimum possible amount of data that is needed to rebuild the original object while being able to present the data as soon as possible (Samet et al.: page 1, section 1 Introduction, 1st paragraph) by using the PPM data compression scheme because the adaptive nature of the scheme, and the flexibility afforded by the arithmetic coding, mean that an effective compression scheme will be built for any input file that is reasonably homogenous (Moffat: page 1917, section I. Introduction, 1st paragraph). Although Prevost et al., Samet et al., and Moffat do not specifically disclose labeling a node containing sub-nodes/children with the label 'S' and labeling a node whose voxels are encoded using a PPM algorithm with the label 'P', it would have been obvious to include the label 'P' for all nodes that have been encoded using PPM and 'S' for all nodes that contain sub-nodes thereby differentiating internal nodes that are to be compressed/merged via the PPM algorithm from internal nodes that are not to be encoded.

Referring to claim 23, claim 23 is similar in scope to claims 3 and 24 and therefore the rationale for claim 3 is incorporated herein, Prevost et al., as modified above, teaches a method of decoding three-dimensional object data, comprising reading continue flag information from a bitstream of encoded three- dimensional object data and decoding the continue flag information (column 15, lines 24-41, i.e. reading continue flag is the starting status which reads 0 when the level=0, indicating the top of the octree has been reached and nrem=0 indicating that the only transition possible to ending); decoding node type information of the bitstream; decoding an 'S' node if the node type information indicates that a current node is an 'S' node; and restoring the three-dimensional object data whose nodes are encoded to a tree structure (Abstract; column 1, lines 35-50; column 9, lines 57-65; columns 10, lines 57-65; column 11, lines 14-28; columns 14-15, lines 43-4, i.e. the 3d object data is generated from the fetched nodes of the octree and displayed indicating that the 3d object data is being decoded from the octree into which it is has been previously encoded) but does not specifically teach decoding a PPM node.

Moffat teaches this limitation (page 1917, section I. Introduction, 2nd paragraph; page 1918, section A. Performance of Figures for Methods A and B, 2nd paragraph; page 1920, section D. Tuning for Speed, 3rd paragraph).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Prevost et al. with the teachings of Samet et al. and Moffat thereby providing a method for performing the transmission of graphical objects over the Internet with the minimum possible amount of

data that is needed to rebuild the original object while being able to present the data as soon as possible (Samet et al.: page 1, section 1 Introduction, 1st paragraph) by using the PPM data compression scheme because the adaptive nature of the scheme, and the flexibility afforded by the arithmetic coding, mean that an effective compression scheme will be built for any input file that is reasonably homogenous (Moffat: page 1917, section I. Introduction, 1st paragraph).

Referring to claim 25, claim 25 is similar in scope to claims 23 and 24 and therefore the rationale for the rejection of claims 23 and 24 is incorporated herein.

Referring to claim 32, the rationale for claim 23 is incorporated herein, Prevost et al. teaches a computer-readable recording medium on which a program enabling the method of claim 23 is recorded (column 10, lines 50-65; column 11, lines 19-26; columns 11-12, lines 65-1; column 15, lines 42-47; column 18, lines 27-30; column 19, lines 14-16; column 23, lines 12-20; column 26, lines 9-19 and 49-67, i.e. an apparatus, comprising a geometrical processor and circuitry for performing to functions as described above wherein the functions are programmable is understood to comprise a computer-readable recording medium on which a program is recorded).

Allowable Subject Matter

Claims 4, 9-15, 19-20, 26-27 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 4, prior art teaches encoding detailed information bit (DIB) data of a node but does not teach encoding detailed information bit (DIB) data of an 'S' node if the node information indicates that the current node is an 'S' node and encoding DIB data of a 'P' node if tie node information indicates that the current node is a 'P' node.

Regarding claims 9 and 19, prior art does not teach selecting, from among the candidate nodes as an optimal node, a node which can minimize a ratio of a difference ΔD between the number of distorted bits before in the candidate nodes and the number of distorted bits after merging the candidate nodes with respect to a difference ΔR between the number of bits before merging the candidate bits and the number of bits after merging the candidate bits; labeling the selected node 'B'; and updating all the candidate nodes except the node selected as an optimal node.

Regarding claim 10, prior art does not teach wherein D is calculated in the following equation using a Hamming distance between an original model V and its approximation *V* as distortion measurement:

$$D = \sum_{x=1}^{X} \sum_{y=1}^{Y} \sum_{z=1}^{Z} \left| V(x, y, z) - \hat{V}(x, y, z) \right|$$

, where XxYxZ represents the resolution of the original model.

Regarding claim 11 and 20, prior art does not teach encoding node type information which indicates whether or not a current node is an 'S' node or a 'P' node; and encoding DIB data of an 'S' node if the node information indicates that the current node is an 'S' node and encoding DIB data of a 'P' node if the node information indicates that the current node is a 'P' node.

Claims 12-15 are dependent on claim 11 and are therefore objected to as being dependent upon an objected claim.

Regarding claim 26, prior art does not teach wherein in decoding the 'S' node, an average color of eight sub-nodes of the current node is decoded as DIB data, and the eight sub-nodes are sequentially decoded into black nodes ('B' nodes) or white nodes ('W' nodes).

Regarding claim 27, prior art does not teach wherein in decoding the PPM node, the current node is PPM-decoded using DIB data bits (DIB) data, and R, G, and B values of 'B' voxels of the current node are decoded by carrying out inverse AAC and inverse DPCM.

Regarding claim 29, prior art does not teach an 'S' node decoder which decodes an average color of eight sub-nodes of the current node as DIB data and then

sequentially decodes the eight sub-nodes into 'B' nodes or 'W' nodes; and a 'P' node decoder which PPM-decodes DIB data of the current node and then decodes R, G, and B values of 'B' voxels of the current node by carrying out inverse AAC and inverse DPCM decoding an 'S' node, if the note type information indicates that a current node is a PPM node.

Response to Arguments

Applicant's arguments with respect to claims 1, 3-6, 23-25, 28, 30 and 32-33 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed 6/22/2006 have been fully considered but they are not persuasive.

Applicant argues, with respect to claims 7, 16 and 17, "…Samet does not describe labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background…".

Examiner respectfully submits that denoting voxels that are occupied by the objects as "BLACK" and labeling blocks/nodes "BLACK" corresponding to the color of their constituent and denoting voxels that are not occupied by the objects as "WHITE" and labeling blocks/nodes "WHITE" corresponding to the color of their constituent while also denoting blocks/nodes corresponding to non-leaf nodes in the tree as "GRAY" does

describe labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background, see the rationale for claims 7, 16 and 17 above as well as page 2, section 2 Octree representation in the Samet et al. reference.

Applicant next argues, with respect to claims 18, 21, 22 and 31, "...At a minimum, Samet does not describe labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background. Instead, Samet describes labeling nodes 'GB' if at least four of its children are black or of type 'GB,' and otherwise labeling nodes 'GW.' (Samet at page 3, section 2.2, first paragraph)...".

Examiner respectfully submits that denoting voxels that are occupied by the objects as "BLACK" and labeling blocks/nodes "BLACK" corresponding to the color of their constituent and denoting voxels that are not occupied by the objects as "WHITE" and labeling blocks/nodes "WHITE" corresponding to the color of their constituent while also denoting blocks/nodes corresponding to non-leaf nodes in the tree as "GRAY" does describe labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background,

see the rationale for claims 18, 21, 22 and 31 above as well as page 2, section 2 Octree representation in the Samet et al. reference.

Applicant then argues, with respect to claim 8, "...For at least the reasons described above, Applicants submit that Samet does not render claim 7 obvious and that Moffat does not supply the teachings missing from Samet. At a minimum, neither Samet nor Moffat describes labeling nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background, as recited in amended claim 7. In particular, while Moffat describes a PPM compression scheme for high performance data compression for text files, nowhere does Moffat describe using a PPM algorithm to encode nodes at the predetermined depth of a tree structure of three-dimensional object data whose voxels are located where objects exist and in the background, as recited in claim (See, Moffat at Abstract and page 1917, Introduction, third paragraph). Accordingly, for at least these reasons, Applicants respectfully submit that the §103(a) rejection of claim 8, which depends from claim 7, in light of Samet in view of Moffat be withdrawn...".

Examiner respectfully submits that Moffat specifically discloses that a digital search tree or trie is central to all ppm implementations and that each node records the number of times a particular symbol has occurred in that context and that three integers in a node were used to record the symbol represented at that node, the number of times that symbol had appeared in its parent's context set, and the number of times it had

been used as a context set, see Moffat, page 1918, section III. Implementing PPM, 1st-3rd paragraphs.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberta Prendergast whose telephone number is (571) 272-7647. The examiner can normally be reached on M-F 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RP 10/17/2006

Ulka Chauhan

ULKA CHAUHAN
SUPERVISORY PATENT EXAMINER